

UTILITY PATENT APPLICATION TRANSMITTAL <small>for new nonprovisional applications under 37 CFR 1.53(b)</small>		Attorney Docket No	0059-1208-0	
		First Inventor or Application Identifier	Kazuya HIRATSUKA, et al.	
		Title		METHOD FOR PRODUCING AN ELECTRIC DOUBLE LAYER CAPACITOR

APPLICATION ELEMENTS

• See MPEP chapter 600 concerning utility patent application contents

1. Fee Transmittal Form (e.g. PTO/SB/17)
(Submit an original and a duplicate for fee processing)

2. Specification Total Pages **23**

3. Drawing(s) (35 U.S.C. 113) Total Sheets

4. Oath or Declaration Total Pages **4**

a. Newly executed (original)

b. Copy from a prior application (37 C.F.R. §1.63(d))
(for continuation/divisional with box 15 completed)

i. **DELETION OF INVENTOR(S)**

Signed statement attached deleting inventor(s) named
in the prior application, see 37 C.F.R. §1.63(d)(2) and
1.33(b).

5. **Incorporation By Reference** (usable if box 4B is checked)
The entire disclosure of the prior application, from which a copy of the
oath or declaration is supplied under Box 4B, is considered to be part
of the disclosure of the accompanying application and is hereby
incorporated by reference therein.

ADDRESS TO: Assistant Commissioner for Patents
Box Patent Application
Washington, DC 20231

ACCOMPANYING APPLICATION PARTS

- 6. Assignment Papers (cover sheet & documents)
- 7. 37 C.F.R. §3.73(b) Statement Power of Attorney
(when there is an assignee)
- 8. English Translation Document (if applicable)
- 9. Information Disclosure Statement (IDS)/PTO-1449 Copies of IDS
Citations
- 10. Preliminary Amendment
- 11. White Advance Serial No. Postcard
- 12. Small Entity Statement(s) Statement filed in prior
application. Status still proper
and desired.
- 13. Certified Copy of Priority Document(s)
(if foreign priority is claimed)
- 14. Other: Notice of Priority

15. If a CONTINUING APPLICATION, check appropriate box, and supply the requisite information below.

Continuation Divisional Continuation-in-part (CIP) of prior application no.:

Prior application information: Examiner: Group Art Unit:

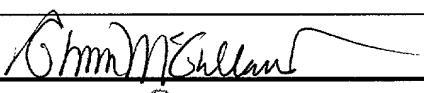
16. Amend the specification by inserting before the first line the sentence:

This application is a Continuation Division Continuation-in-part (CIP)
of application Serial No. Filed on

This application claims priority of provisional application Serial No. Filed

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- 1 -

METHOD FOR PRODUCING AN ELECTRIC DOUBLE LAYER CAPACITOR

The present invention relates to a method for producing an electric double layer capacitor which is excellent in reliability of the performance for a long 5 period of time and which has a high withstand voltage and a high energy density.

An electric double layer capacitor has excellent properties with respect to the output density and the long term reliability for charge and discharge cycles, 10 but it has a problem such that its energy density is low as compared with e.g. a lithium ion secondary cell. The amount of energy to be stored in a capacitor is proportional to the capacitance of the capacitor and to the square of the applied voltage. Accordingly, the 15 energy density can effectively be increased by increasing the withstand voltage of the capacitor.

The withstand voltage of an electric double layer capacitor is restricted basically by the electrochemical decomposition voltage of the electrolyte. When an 20 organic electrolyte having a high withstand voltage as

compared with an aqueous electrolyte, is used as the electrolyte, electrolysis is likely to take place due to impurities, particularly water, contained in the electrolyte. Accordingly, for the organic electrolyte, 5 both the solvent and the electrolytic salt will be used as highly purified and dehydrated.

On the other hand, for the electrodes for an electric double layer capacitor, an electrode material having a high surface area is used, and when it is to be 10 combined with the above organic electrolyte, activated carbon is usually employed as the electrode material having a high surface area. Activated carbon is a porous material having fine pores of a few nm, but it is likely to adsorb moisture in the environment, as it has a high 15 adsorbing ability. Accordingly, activated carbon is required to be highly dehydrated during the process for producing an electric double layer capacitor.

In order to completely remove moisture from fine pores of activated carbon, it is usually required to 20 carry out dehydration treatment at a high temperature of at least 300°C in vacuum or in an inert gas atmosphere. However, activated carbon particles are usually molded by means of a binder such as an organic polymer on a current collector to form an electrode, and the binder undergoes 25 thermal decomposition by high temperature treatment of at least 300°C. Therefore, heat treatment may usually be

possible only at a temperature of not higher than 200°C, whereby it is difficult to completely remove moisture in the activated carbon electrode.

For the purpose of increasing the energy density, an 5 electric double layer capacitor employing an organic electrolyte is operated at a voltage of at least 2 V which is higher than the theoretical decomposition voltage (1.23 V) of water. Therefore, when a capacitor cell is assembled and then a voltage is applied for 10 operation, moisture remaining in the pores will be electrolyzed to generate a gas. It has been found that the generated gas will gradually accumulate in pores of activated carbon and will remain in the interior of the element comprising electrodes facing each other with a 15 separator interposed between them and impregnated with the electrolyte, without being discharged from the element.

If the capacitor is used for a long period of time under such a condition, the electrolyte in pores will be 20 expelled by the generated gas, whereby the expected capacitance will not be obtained. Further, electrically conductive paths by ion transfer within pores will be cut off, thus leading to deterioration of the performance such as a decrease in the capacitance or an increase of 25 the internal resistance.

Under these circumstances, it is an object of the

present invention to solve the above-mentioned problems of the prior art and to provide a method for producing an electric double layer capacitor which is excellent in reliability of the performance for a long period of time 5 and which has a high operation voltage and a high energy density.

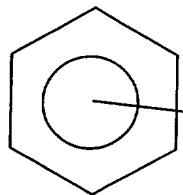
The present invention provides a method for producing an electric double layer capacitor, which comprises impregnating an element comprising positive and 10 negative electrodes facing each other with a separator interposed between them, with an organic electrolyte capable of forming an electric double layer on the surface of the electrodes to store electric charge, and then applying a voltage to the element, wherein said 15 positive and negative electrodes are made of electrodes containing a carbonaceous material having a specific surface area of from 100 to 3,000 m^2/g , and said organic electrolyte contains benzene or its chlorine derivative having at least one hydrogen atom of benzene substituted 20 by a chlorine atom.

Now, the present invention will be described in detail with reference to the preferred embodiments.

In the present invention, benzene or its chlorine derivative having at least one hydrogen atom of benzene 25 substituted by a chlorine atom (hereinafter referred to as "a chlorine derivative of benzene") is represented by

a compound of the formula 1. In the formula 1, n is an integer of from 1 to 6.

5



$(C_1)_n$

Formula 1

In the present invention, the benzene or its chlorine derivative is preferably at least one member selected from the group consisting of benzene, monochlorobenzene, dichlorobenzene and trichlorobenzene. The structure of dichlorobenzene is not particularly limited, and any one of o-dichlorobenzene, m-dichlorobenzene and p-dichlorobenzene may be preferably employed. Likewise, the structure of trichlorobenzene is not particularly limited.

In the present invention, the amount of the benzene or its chlorine derivative in the electrolyte may suitably be adjusted depending upon the amount of the remaining moisture or the pore characteristics of the carbonaceous material contained in the electrodes. It is preferred, however, that the benzene or its chlorine derivative is maintained to be completely dissolved in the organic electrolyte. Further, as the benzene or its chlorine derivative is added, the dielectric constant of the organic electrolyte decreases. Accordingly, the

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amount of the benzene or its chlorine derivative is preferably controlled within a range where a decrease in the ion conductivity due to a decrease in the dielectric constant of the organic electrolyte, is little. Thus,
5 the amount is preferably from 0.1 to 30 wt%, particularly preferably from 1 to 10 wt%, in the electrolyte.

The operation mechanism in the present invention is not clearly understood, but it is considered that the benzene or its chlorine derivative contained in the
10 electrolyte has high affinity to a pseudo-graphite surface present on the inner walls of pores of the carbonaceous material and is likely to be adsorbed in substitution with the water remaining in fine pores without being removed by the heat treatment. Thus, the
15 remaining water can readily be expelled from the fine pores and discharged in the electrolyte outside the fine pores. When a voltage is applied to the element impregnated with the electrolyte, such water will readily be electrolyzed and gasified.

20 The storage of electric charge by formation of an electric double layer takes place mainly in the interior of pores. With a conventional electric double layer capacitor containing no benzene or chlorine derivative in the electrolyte, if a voltage is applied to the element
25 impregnated with the electrolyte, a gas generated by the electrolysis of water remaining in the fine pores will

remain in the fine pores, whereby the performance of the electric double layer capacitor tends to deteriorate.

Whereas, in the present invention, as mentioned above, it is considered that the gas generated by the electrolysis

5 by the remaining water by the application of a voltage, will be present outside the fine pores i.e. not in the fine pores. Namely, it is present in macro pores within the activated carbon particles or in spaces among the particles, or it will be discharged as bubbles out of the 10 element. Thus, it is considered that deterioration of the performance of the electric double layer capacitor can be controlled to be little.

However, the decomposition gas generated by the application of a voltage to the element increases the 15 inner pressure of the electric double layer capacitor cell. Accordingly, it is preferred that the application of the voltage during the production process is carried out in a dry atmosphere in an open condition to discharge the generated gas out of the capacitor cell. Here, the 20 open condition is a condition where the element is not accommodated in a cell or even if it is accommodated in a cell, the cell is not closed.

Here, the dry atmosphere preferably has a dew point of not higher than -20°C, more preferably not higher than 25 -30°C, most preferably not higher than -40°C.

The voltage to be applied to the element is

preferably at least 2 V which is higher than the decomposition voltage of water, more preferably at least 2.5 V. The temperature for the application of the voltage to the element is preferably from 15 to 85°C, 5 more preferably from 20 to 70°C. If the voltage is applied under heating, the effect for increasing the durability of the electric double layer capacitor will be large, and the time for application of the voltage can be shortened. However, if the temperature is too high, the 10 initial capacitance tends to decrease, and the internal resistance tends to increase.

Further, in the present invention, it is preferred to maintain the element under reduced pressure after the application of the voltage to the element, whereby the 15 generated gas can more effectively be removed from the element. Here, the "reduced pressure" is preferably a reduced pressure of at most 160 Torr, more preferably at most 10 Torr.

The application of a voltage to the element 20 impregnated with the electrolyte is carried out usually by connecting the electrode constituting a positive electrode for the electric double layer capacitor (hereinafter referred to as the positive electrode of the element) to a plus terminal of a DC power source and 25 connecting the electrode constituting a negative electrode of the electric double layer capacitor

(hereinafter referred to as the negative electrode of the element) to a minus terminal of a DC power source.

However, in order to further increase the durability of the electric double layer capacitor, it is preferred that

5 this application of a voltage is repeated at least once reversing the connection of the positive electrode and the negative electrode. Namely, the application of a voltage to the element preferably comprises the following steps A and B:

10 Step A: a step of applying a voltage across the positive and negative electrodes by a DC power source, and

15 Step B: a step of applying a voltage by inversely connecting the positive and negative electrodes to the DC power source as compared with step A.

Here, either step A or step B may be carried out first, or step A and step B may be repeated alternately.

With respect to the electrodes in the present invention, both the positive electrode and the negative electrode contain a carbonaceous material having a specific surface area of from 100 to 3000 m²/g for forming an electric double layer at the interface with the electrolyte. As such a carbonaceous material, resin type activated carbon such as phenol, coconut shell type activated carbon, coke type activated carbon, pitch type activated carbon, carbon nanotube, carbon aerogel, carbon

black or polyacene may, for example, be preferably used. The electrodes are preferably formed by adding an organic binder to at least one type of these carbonaceous materials. Particularly, they are preferably formed by 5 adding an organic binder such as polytetrafluoroethylene or polyvinylidene fluoride to a carbonaceous material, followed by molding into a sheet, which is then bonded to a current collector, or by coating a liquid containing a carbonaceous material and the organic binder on a current 10 collector.

In the present invention, the elute contained in the organic electrolyte to store electric charge by forming an electric double layer, is preferably a quaternary onium salt from the viewpoint of the electrical 15 conductivity, the solubility and the electrochemical stability. Particularly, it preferably has a cation represented on $R^1R^2R^3R^4N^+$ or $R^1R^2R^3R^4P^+$, wherein each of R^1 , R^2 , R^3 and R^4 which are independent of one another, is a C_{1-6} alkyl group or a C_{6-10} aryl group. Particularly 20 preferred is a salt comprising such a cation and an anion of e.g. BF_4^- , PF_6^- , $CF_3SO_3^-$, ASF_6^- , $N(SO_2CF_3)_2^-$ or ClO_4^- .

The concentration of the above onium salt in the electrolyte is preferably at least 0.5 mol/l, more preferably at least 1.0 mol/l, for the purpose of 25 securing the ion amount required for forming an electric double layer and for obtaining sufficient electrical

conductivity.

The organic solvent to be used for the organic electrolyte is preferably at least one solvent selected from the group consisting of a cyclic carbonate such as 5 ethylene carbonate, propylene carbonate or butylene carbonate, a linear carbonate such as dimethyl carbonate, ethyl methyl carbonate or diethyl carbonate, sulfolane, a sulfolane derivative and a nitrile such as acetonitrile or glutaronitrile.

10 The separator in the present invention is not particularly limited, but is preferably made of a porous material which is excellent in the electrical insulating property and in the chemical stability against the electrolyte and which is capable of absorbing a large 15 amount of the electrolyte and excellent in the liquid-holding property. Specifically, it is preferably made of inorganic fibers such as glass fibers, silica fibers, alumina fibers or whiskers thereof, natural fibers such as manila hemp, or organic fibers such as synthetic 20 fibers of e.g. polyolefin or polyester. It is preferably a sheet prepared from such fibers. Also preferred is a micro porous film having fine perforations formed by stretching a film made of e.g. polyolefin or polyester.

The structure of electric double layer capacitor of 25 the present invention is not particularly limited and may preferably be any one of a coin structure wherein disk-

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shaped positive and negative electrodes face each other with a separator interposed therebetween and are impregnated with an electrolyte, a laminated structure wherein rectangular positive and negative electrodes are 5 alternately laminated with a separator interposed therebetween, impregnated with an electrolyte and accommodated in an angular casing, and a winding structure wherein a pair of strip-shaped positive and negative electrodes are wound to face each other with a 10 separator interposed therebetween, impregnated with an electrolyte and accommodated in a cylindrical casing.

Now, the present invention will be described in further detail with reference to Examples (Examples 1 to 12, 15 and 16) and Comparative Examples (Examples 13 and 14). However, it should be understood that the present 15 invention is by no means restricted by such specific Examples.

EXAMPLES 1 to 14

80 parts by weight of high purity phenol resin type 20 activated carbon having a specific surface area of 1800 m²/g and an average particle size of 10 µm, 10 parts by weight of carbon black as a conductive material and 10 parts by weight of polyethylene tetrafluoroethylene powder as a binder, were mixed, then kneaded while 25 dropwise adding ethanol and rolled, followed by drying at 200°C for 30 minutes to remove ethanol thereby to obtain

an electrode sheet having a thickness of 140 μm .

The above electrode sheet was bonded to each side of an aluminum foil current collector with a thickness of 40 μm having a lead terminal at a portion having a width of 5 6 cm and a length of 13 cm, by means of a conductive adhesive, followed by roll pressing to obtain an electrode assembly having the electrode and the current collector integrated and having a thickness of 330 μm , and this assembly was used for positive and negative 10 electrode assemblies.

A sheet made of glass fibers was punched out in a rectangular shape having a width of 6.6 cm and a length of 13.6 cm to obtain a separator. 18 sheets of the above positive electrode assembly and 18 sheets of the above 15 negative electrode assembly were alternately laminated with the separator interposed to obtain an element. This element was vacuum-dried at 200°C for 24 hours and then accommodated in a bottomed angular aluminum metal casing having a height of 15 cm, a width of 7 cm and a thickness 20 of 2.2 cm.

As organic electrolytes, those having the additives identified in Table 1 incorporated in the proportions (the concentrations in the electrolytes) as shown in Table 1 to propylene carbonate solutions having 1.5 mol/l 25 of $(\text{C}_2\text{H}_5)_3(\text{CH}_3)\text{NBF}_4$ dissolved therein, were prepared. Each organic electrolyte was contacted with a molecular sieve

which was preliminarily heated and dehydrated, to remove the water in the electrolyte to a level of not higher than 10 ppm, and then it was injected in the metal casing to impregnate the element therewith.

5 Further, each element was subjected to voltage application treatment in an open condition and reduced pressure treatment, as shown in Table 1. As shown in Table 1, there are some cases wherein neither the voltage application treatment nor the reduced pressure treatment
10 was carried out. In the voltage application treatment, the positive electrode of the element was connected to a plus terminal of a DC power source and the negative electrode of the element was connected to a minus terminal of the DC power source, and a voltage of 2.8 V
15 was continuously applied for 12 hours in a dry atmosphere (dew point: -50°C) while the metal casing was open without sealing. The reduced pressure treatment was carried out after the voltage application treatment by maintaining the element under a reduced pressure of 5
20 torr for one minute.

Then, electrode leads of the positive and negative electrodes were respectively bundled and welded by ultrasonic welding to positive and negative terminals air-tightly and insulatedly attached to an aluminum cover. Then, the cover was fit in the opening of the above metal casing, and the periphery was welded by laser
25

for sealing to obtain an electric double layer capacitor. With respect to samples of Examples 1, 6 and 13 to which no voltage application treatment in an open condition was applied, after sealing each metal casing, the positive 5 electrode of the electric double layer capacitor was connected to a plus terminal of a DC power source, and the negative electrode was connected to a minus terminal of the DC power source, and a voltage of 2.8 V was continuously applied for 12 hours, whereupon the 10 capacitor was used as a complete sample of the electric double layer capacitor.

The initial service capacitance and the internal resistance of each electric double layer capacitor thus obtained, were measured, and then as an accelerated test 15 on reliability of the performance, this capacitor was maintained in a constant temperature tank of 45°C for 2000 hours while applying a voltage of 2.7 V to carry out a durability test. The service capacitance and the internal resistance after the durability test were 20 measured, and the change in the capacitance and the change in the resistance after the durability test were calculated against the initial properties. The results are shown in Table 2.

EXAMPLE 15

25 An electric double layer capacitor was prepared in the same manner as in Example 3 except that the voltage

application treatment was changed as follows. Namely, the positive electrode of the element was connected to a minus terminal of a DC power source and the negative electrode of the element was connected to a plus terminal 5 of the DC power source, and a voltage of 2.8 v was continuously applied for 6 hours, in a dry atmosphere (dew point: -50°C) while the metal casing was open without sealing. Then, the positive electrode of the element was connected to the plus terminal of the DC 10 power source, and the negative electrode was connected to the minus terminal of the DC power source, and a voltage of 2.8 V was continuously applied for further 6 hours. The obtained electric double layer capacitor was evaluated in the same manner as in Example 1. The 15 results are shown in Table 2.

EXAMPLE 16

An electric double layer capacitor was prepared in the same manner as in Example 15 except that instead of benzene, 5 wt% of o-dichlorobenzene was incorporated in 20 the electrolyte. This electric double layer capacitor was evaluated in the same manner as in Example 1. The results are shown in Table 2.

Table 1

	Additive	Amount (wt%)	Voltage application treatment in an open condition	Reduced pressure treatment
Ex. 1	Benzene	5	Not carried out	Not carried out
Ex. 2	Benzene	5	Carried out	Not carried out
Ex. 3	Benzene	5	Carried out	Carried out
Ex. 4	Benzene	2	Carried out	Carried out
Ex. 5	Benzene	10	Carried out	Carried out
Ex. 6	Monochlorobenzene	5	Not carried out	Not carried out
Ex. 7	Monochlorobenzene	5	Carried out	Not carried out
Ex. 8	Monochlorobenzene	5	Carried out	Carried out
Ex. 9	o-dichlorobenzene	5	Carried out	Carried out
Ex. 10	m-dichlorobenzene	5	Carried out	Carried out
Ex. 11	p-dichlorobenzene	5	Carried out	Carried out
Ex. 12	1,2,4- trichlorobenzene	5	Carried out	Carried out
Ex. 13	-	-	Not carried out	Not carried out
Ex. 14	Naphthalene	5	Carried out	Carried out

Table 2

	Initial stage		After the durability test			
	Service capaci-tance	Internal resist-ance	Service capaci-tance	Change in capaci-tance	Internal resist-ance	Change in capaci-tance
	(F)	(mΩ)	(F)	(%)	(mΩ)	(%)
Ex. 1	1720	2.8	1430	-17	5.0	+80
Ex. 2	1700	2.7	1450	-15	4.5	+65
Ex. 3	1710	2.7	1470	-14	4.3	+60
Ex. 4	1720	2.9	1440	-15	4.7	+62
Ex. 5	1710	3.0	1400	-16	5.5	+62
Ex. 6	1730	2.5	1440	-17	4.8	+79
Ex. 7	1710	2.6	1440	-16	4.3	+66
Ex. 8	1710	2.6	1470	-14	4.2	+62
Ex. 9	1710	2.8	1500	-12	4.4	+58
Ex. 10	1720	2.8	1480	-14	4.5	+61
Ex. 11	1710	2.7	1490	-19	4.3	+59
Ex. 12	1700	2.7	1280	-19	5.5	+105
Ex. 13	1730	3.0	950	-45	8.8	+192
Ex. 14	1720	2.9	480	-72	18.9	+520
Ex. 15	1710	2.8	1520	-11	4.3	+55
Ex. 16	1720	2.7	1530	-11	4.2	+54

According to the present invention, it is possible to increase the withstand voltage of an electric double layer capacitor, and it is possible to obtain an electric double layer capacitor which is excellent in reliability of the performance for a long period of time even if a high voltage is applied and which has a high energy density.

WHAT IS CLAIMED IS:

1. A method for producing an electric double layer capacitor, which comprises impregnating an element comprising positive and negative electrodes facing each other with a separator interposed between them, with an organic electrolyte capable of forming an electric double layer on the surface of the electrodes to store electric charge, and then applying a voltage to the element, wherein said positive and negative electrodes are made of electrodes containing a carbonaceous material having a specific surface area of from 100 to 3,000 m^2/g , and said organic electrolyte contains benzene or its chlorine derivative having at least one hydrogen atom of benzene substituted by a chlorine atom.

15 2. The method for producing an electric double layer capacitor according to Claim 1, wherein said benzene or its chlorine derivative is at least one member selected from the group consisting of benzene, monochlorobenzene, dichlorobenzene and trichlorobenzene.

20 3. The method for producing an electric double layer capacitor according to Claim 1, wherein the voltage is applied to the element in a dry atmosphere in an open condition.

4. The method for producing an electric double layer capacitor according to Claim 1, wherein the benzene or its chlorine derivative is contained in an amount of from 0.1 to 30 wt% in the organic electrolyte.

5. The method for producing an electric double layer capacitor according to Claim 1, wherein after the application of a voltage to the element, the element is maintained under reduced pressure.

5 6. The method for producing an electric double layer capacitor according to Claim 1, wherein the voltage is applied to the element in a dry atmosphere in an open condition, and thereafter, the element is maintained under reduced pressure.

10 7. The method for producing an electric double layer capacitor according to Claim 1, wherein a voltage of at least 2.5V is applied to the element at a temperature of from 15 to 85°C.

15 8. The method for producing an electric double layer capacitor according to Claim 1, wherein the application of a voltage to the element comprises the following steps A and B:

Step A: a step of applying a voltage across the positive and negative electrodes by a DC power source,

20 and

Step B: a step of applying a voltage by inversely connecting the positive and negative electrodes to the DC power source as compared with step A.

9. The method for producing an electric double layer capacitor according to Claim 1, wherein the solute contained in the organic electrolyte is a salt comprising a cation represented by $R^1R^2R^3R^4N^+$ or $R^1R^2R^3R^4P^+$, wherein each

of R^1 , R^2 , R^3 and R^4 which are independent of one another, is a C_{1-6} alkyl group or a C_{6-10} aryl group, and an anion of BF_4^- , PF_6^- , $CF_3SO_3^-$, AsF_6^- , $N(SO_2CF_3)_2^-$ or ClO_4^- .

10. The method for producing an electric double layer capacitor according to Claim 1, wherein the organic electrolyte contains at least one solvent selected from the group consisting of ethylene carbonate, propylene carbonate, butylene carbonate, dimethyl carbonate, ethyl methyl carbonate, diethyl carbonate, sulfolane, a 10 sulfolane derivative, acetonitrile and glutaronitrile.

11. The method for producing an electric double layer capacitor according to Claim 1, wherein after the application of a voltage to the element, the element is maintained under a reduced pressure of at most 160 Torr.

ABSTRACT OF THE DISCLOSURE

A method for producing an electric double layer capacitor, which comprises impregnating an element comprising positive and negative electrodes facing each other with a 5 separator interposed between them, with an organic electrolyte capable of forming an electric double layer on the surface of the electrodes to store electric charge, and then applying a voltage to the element, wherein said positive and negative electrodes are made of electrodes 10 containing a carbonaceous material having a specific surface area of from 100 to 3,000 m^2/g , and said organic electrolyte contains benzene or its chlorine derivative having at least one hydrogen atom of benzene substituted by a chlorine atom.

Declaration and Power of Attorney For Patent Application

特許出願宣言書及び委任状

Japanese Language Declaration

日本語宣言書

下記の氏名の発明者として、私は以下の通り宣言します。

私の住所、私書箱、国籍は下記の私の氏名の後に記載された通りです。

下記の名称の発明に関して請求範囲に記載され、特許出願している発明内容について、私が最初かつ唯一の発明者（下記の氏名が一つの場合）もしくは最初かつ共同発明者（下記の名称が複数の場合）であると信じています。

上記発明の明細書は、
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 ____月____日に提出され、米国出願番号または特許協定条約国際出願番号を_____とし、
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私は、連邦規則法典第37編第1条56項に定義されるとおり、特許資格の有無について重要な情報を開示する義務があることを認めます。

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled.

METHOD FOR PRODUCING AN ELECTRIC
DOUBLE LAYER CAPACITOR

the specification of which

is attached hereto.
 was filed on _____
 as United States Application Number or
 PCT International Application Number
 _____ and was amended on
 _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56.

Japanese Language Declaration

(日本語宣言書)

私は、米国法典第35編119条 (a) - (d) 項又は365条 (b) 項に基づき下記の、米国以外の国の少なくとも一ヵ国を指定している特許協力条約365 (a) 項に基づく国際出願、又は外国での特許出願もしくは発明者証の出願についての外国優先権をここに主張するとともに、優先権を主張している、本出願の前に出願された特許または発明者証の外国出願を以下に、枠内をマークすることで、示しています。

Prior Foreign Application(s)

外国での先行出願

11-55932

(Number)
(番号)

Japan

(Country)
(国名)

(Number)
(番号)

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(Application No.)
(出願番号)

私は、下記の米国法典第35編120条に基づいて下記の米国特許出願に記載された権利、又は米国を指定している特許協力条約365条 (c) に基づく権利をここに主張します。また、本出願の各請求範囲の内容が米国法典第35編112条第1項又は特許協力条約で規定された方法で先行する米国特許出願に開示されていない限り、その先行米国出願書提出日以降で本出願書の日本国内または特許協力条約国際提出日までの期間中に入手された、連邦規則法典第37編1条56項で定義された特許資格の有無に関する重要な情報について開示義務があることを認識しています。

(Application No.)
(出願番号)

(Application No.)
(出願番号)

私は、私自信の知識に基づいて本宣言書中で私が行なう表明が真実であり、かつ私の入手した情報と私の信じるところに基づく表明が全て真実であると信じていること、さらに故意になされた虚偽の表明及びそれと同等の行為は米国法典第18編第1001条に基づき、罰金または拘禁、もしくはその両方により処罰されること、そしてそのような故意による虚偽の声明を行なえば、出願した、又は既に許可された特許の有効性が失われることを認識し、よってここに上記のごとく宣誓を致します。

I hereby claim foreign priority under Title 35, United States Code, Section 119 (a)-(d) or 365(b) of any foreign application(s) for patent or inventor's certificate, or Section 365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or PCT International application having a filing date before that of the application on which priority is claimed.

Priority Claimed 優先権主張	
<input checked="" type="checkbox"/> 3 / March / 1999	<input type="checkbox"/>
(Day/Month/Year Filed) (出願年月日)	Yes はい
	No いいえ
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> (Day/Month/Year Filed) (出願年月日)	Yes はい
	No いいえ

I hereby claim the benefit under Title 35, United States Code, Section 119(e) of any United States provisional application(s) listed below.

(Application No.) (出願番号)	(Filing Date) (出願日)
I hereby claim the benefit under Title 35, United States Code, Section 120 of any United States application(s), or Section 365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of Title 35, United States Code Section 112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56 which became available between the filing date of the prior application and the national or PCT International filing date of application.	

(Status: Patented, Pending, Abandoned) (現況 : 特許許可済、係属中、放棄済)
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(Status: Patented, Pending, Abandoned) (現況 : 特許許可済、係属中、放棄済)
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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Japanese Language Declaration
(日本語宣言書)

委任状：私は下記の発明者として、本出願に関する一切の手続きを米特許商標局に対して遂行する弁理士または代理人として、下記の者を指名いたします。
(弁護士、または代理人の指名及び登録番号を明記のこと)

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith: (list name and registration number)

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(第三以降の共同発明者についても同様に記載し、署名すること)

(Supply similar information and signature for third and subsequent joint inventors.)

Japanese Language Declaration

(日本語宣言書)

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国籍	Citizenship		
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第五の共同発明者の氏名	Full name of fifth joint inventor, if any		
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第六の共同発明者の氏名	Full name of sixth joint inventor, if any		
第六の共同発明者の署名	日付	Sixth joint Inventor's signature	Date
住所	Residence		
国籍	Citizenship		
郵便の宛先	Post Office Address		

(第六またはそれ以降の共同発明者に対しても同様な情報および署名を提供すること。)

(Supply similar information and signature for third and subsequent joint inventors.)